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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/582,342	06/09/2006	Tetsuo Kawamura	128335	4981

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EXAMINER	
BARROW, AMANDA J	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/582,342	KAWAMURA, TETSUO	
	Examiner	Art Unit	
	AMANDA BARROW	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *6/3/2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) *14* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/9/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-13, in the reply filed on 6/3/2009 is acknowledged. The traversal is on the ground(s) that each and every element of independent claim 1 is known in the prior art and that a lack of unity has not been established. This is not found persuasive. The common subject matter between Groups I and II is a fuel cell comprising an anode, a cathode, a polymer electrolyte membrane disposed between the cathode and anode wherein the cathode has an oxygen absorbing releasing material comprised of one or more cerium oxide compounds which is in contact with a catalyst. As asserted in the restriction requirement and further demonstrated in the non-final rejection below, this does not make a contribution over the prior art (Ito et al. (US Patent Application 2003/0004054 A1) in view of Hori et al. (US Patent Application 2003/0134180 A1). Therefore, Group II comprising claim 14 is withdrawn.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-5, 7-9 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (US Patent Application 2003/0004054 A1) (hereinafter "Ito") in view of Hori et al. (US Patent Application 2003/0134180 A1) (hereinafter "Hori").

Regarding claim 1, Ito teaches catalyst particles to be used in fuel cells which comprise a base particle that can be selected from metal oxides among other materials that is partly covered by one or more kind of metal or a derivative thereof (paragraphs 2, 11, 16, and 20). Ito teaches that base particles can quickly accommodate changes in the oxygen concentration by absorbing and releasing oxygen (paragraphs 50 and 68). Ito also teaches that the base particle would be able to take in and release oxygen more quickly with higher oxygen occlusion and release function when the base particle and the catalyst are located in closer proximity (paragraph 49). Figure 1 illustrates that the catalyst and base particle ("oxygen absorbing/releasing material") are in contact.

Ito teaches that the catalyst particles can be used in fuel cells (paragraph 2) but does not recite that they are to be specifically placed in the cathode of the fuel cell. Hori teaches a cathode comprising a conductive carbon carrying a catalyst mixed with an ion-conductive polymer electrolyte (paragraph 9).

The combination of familiar elements is likely to be obvious when it does no more than yield predictable results. See *KSR International Co. v. Teleflex Inc.*, 550 U.S., 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, A.). It would therefore be obvious to a person of ordinary skill in the art to place the base particles of Ito into the system of Hori as Ito specifically points out that these particles can be used in fuel cells, that the catalyst particles have higher catalytic activities with the incorporation of the base particles, and that the base particles can quickly accommodate changes in oxygen concentration providing a more efficient system (paragraphs 2, 10 and 50).

Regarding claims 2 and 3, Ito teaches that the base particle ("oxygen absorbing/releasing material") can be selected from metal oxides (paragraph 42). Ito gives the example of cerium oxide (ceria) which is an oxidation-number-variable metal oxide which absorbs or releases oxygen thus changing the oxidation number based on the adsorption of oxygen or change in oxidation number (paragraphs 42 and 47-48).

Regarding claim 4, Ito teaches that the base particle ("oxygen absorbing/releasing material") is comprised of cerium oxide CeO2 (paragraphs 42, 47-48).

Regarding claim 5, Ito does not recite the weight percent of the oxygen absorbing/releasing material to be used in the fuel cell; however, Ito does disclose that that it is preferable to include the anti-sintering agent in a proportion from 1 to 20% by weight of the surface coating layer 2 because when the proportion is more than 20% by weight, the specific surface area having catalytic activity is greatly decreased by the presence of the anti-sintering agent 3 (paragraph 78). Therefore, Ito demonstrates that increasing the weight percentage of the anti-sintering agent (which results in a decrease of the weight percentage of the oxygen

absorbing/releasing material) will decrease the catalytic activity as the surface area of the absorbing/releasing material decreases.

The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is rendered an obvious modification for a person of ordinary skill in the art to make. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.). In this case, the known result effective variable is the amount of absorbing/releasing material and the result is an increase or decrease in catalytic activity if the amount is increased or decreased, respectively.

Regarding claim 7, Ito teaches the particle size of the base particle ("oxygen absorbing/releasing material") is of a nanometer order (paragraph 62). Ito teaches that the term "nanometer order" refers to sizes below about 100 nm (paragraph 6).

The claim recites that the average particle size of oxygen absorbing/releasing material is 2 to 40 nm. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d.257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990); *In re Geisler*, 116 F.3d 1465, 1469-71, 43 USPQ2d 1362, 1365-66 (Fed Circ. 1997). See MPEP 2144.05.

Regarding claim 8, Ito teaches that the base particle ("oxygen absorbing/releasing material") is comprised of CeO_2 which has been partly reduced to form $CeO_{3/2}$ (equivalent to Ce_2O_3) (paragraphs 47-48).

Regarding claim 9, Ito does not recite the specifics of the fuel cell to be used; however Hori teaches that the polymer electrolyte and carbon (which is the carrier) are to be in a weight ratio of 1:1 (paragraph 59). The combination of familiar elements is likely to be obvious when it does no more than yield predictable results. See *KSR International Co. v. Teleflex Inc.*, 550 U.S., 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, A.). It would therefore be obvious to a person of ordinary skill in the art to adapt the weight ratio used by Hori to the system of Ito in order to provide a cathode and overall fuel cell with an excellent life characteristic (Hori - paragraph 9).

Regarding claim 12, Ito is silent as to whether the base particles ("oxygen/releasing material") are contained more towards the electrolyte membrane side in the catalyst layer than towards the diffusion side or whether or not none of the base particles are located on the diffusion layer side. Hori discloses a cathode in which there are two layers formed: one layer with conductive carbon carrying a catalyst metal and a second layer with conductive carbon carrying no metal, both of which are have an ion-conductive polymer electrolyte mixed throughout.

By adapting the base particles ("oxygen absorbing/releasing material") of Ito to the cathode of Hori as discussed in the rejection of claim 1, this would allow for the cathode to have the base particles contained towards the diffusion layer side and none of the base particles would be contained towards the diffusion layer side as the base particles would only be added to the first layer (the conductive carbon carrying a catalyst metal).

As aforementioned in the rejection of claim 1, it would be obvious to a person of ordinary skill in the art to place the base particles of Ito into the system of Hori as Ito specifically points

out that these particles can be used in fuel cells, that the catalyst particles have higher catalytic activities with the incorporation of the base particles, and that the base particles can quickly accommodate changes in oxygen concentration providing a more efficient system (paragraphs 2, 10 and 50). Hori provides a layout for the cathode in which two layers are provided allowing for the base particles to be contained entirely towards the electrolyte membrane side rather than the diffusion layer side.

Regarding claim 13, Ito does not disclose the specifics of the fuel cell that the base particles are to be used in; however, Hori teaches a polymer electrolyte fuel cell in which a polymer electrolyte membrane is disposed between an anode and a cathode (paragraphs 1, 23). By adapting the base particles of Ito to the cathode of Hori as aforementioned in the rejection of claim 1, the system recited in the claim is made.

Again, it would be obvious to a person of ordinary skill in the art to place the base particles of Ito into the system of Hori as Ito specifically points out that these particles can be used in fuel cells, that the catalyst particles have higher catalytic activities with the incorporation of the base particles, and that the base particles can quickly accommodate changes in oxygen concentration providing a more efficient system (paragraphs 2, 10 and 50).

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (US Patent Application 2003/0004054 A1) in view of Hori et al. (US Patent Application 2003/0134180 A1) as applied to claims 1-5, 7-9 and 12-13 above, and further in view of James et al. (US Patent 4,751,161) (hereinafter "James").

Regarding claim 6, neither Hori nor Ito specify that the amount of the catalyst is 30 wt. % or less of the catalyst layer; however, as evidenced by James, it is well known in the art to provide a cathode in which the amount of catalyst is in the range of 0-30 weight percent (column 3, lines 56-59).

Consequently, as shown by James, the amount of catalyst deposited is considered a known-result effective variable. It would be obvious to a person of ordinary skill in the art to adapt the catalyst ratio given by James to the cathode of Hori and Ito in order to produce an electrochemical cell with a high output voltage (James - column 2, lines 15-18).

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (US Patent Application 2003/0004054 A1) in view of Hori et al. (US Patent Application 2003/0134180 A1) as applied to claims 1-5, 7-9 and 12-13 above, and further in view of Yi et al. (US Patent Application 2001/0004501 A1) (hereinafter "Yi").

Regarding claim 10, Hori teaches that the "carrier" is a conductive carbon; however, Hori is silent to whether or not the carbon has been treated to be hydrophobic. Yi teaches a cathode that has been rendered hydrophobic by treatment (paragraph 74).

It would be obvious to a person of ordinary skill in the art to incorporate the hydrophobic treatment of Yi to the cathode of Ito and Hori in order to minimize the water accumulation, maximize access of the oxidant reactant gas to the catalyst and to avoid flooding (Yi – paragraph 5).

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (US Patent Application 2003/0004054 A1) in view of Hori et al. (US Patent Application 2003/0134180 A1) as applied to claimed 1-5, 7-9 and 12-13 above, and further in view of Wilson (US Patent 5,234,777).

Regarding claim 11, Ito does not recite the specifics of the fuel cell to be used and Hori teaches that a catalyst ink is used; however, neither reference discloses treating the catalyst ink to increase the number of pores. Wilson does teach agitating a mixture with ultrasound to uniformly disperse the catalyst in the ink (column 4, lines 60-64). The admitted prior art recited in the applicant's specification teaches that this is the method used to treat the catalyst ink so that the number of pores is increased. Although Wilson does not recite that this increases the pore volume, it is inherent that the number of pores in the catalyst layer would also increase in the system of Wilson as the same process is taught.

A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

It would therefore be obvious to a person of ordinary skill in the art to adapt the treatment process of the catalyst ink to the system of Wilson as agitating the mixture with ultrasound creates a more uniform distribution of catalyst in the ink and also forms the mixture to a viscosity suitable for coating the release blank used to make the catalyst layer (Wilson, column 4, lines 60-64).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMANDA BARROW whose telephone number is (571)270-7867. The examiner can normally be reached on 7:30am-5pm EST. Monday-Friday, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AMANDA BARROW/
Examiner, Art Unit 1795

/Brian J. Sines/

Supervisory Patent Examiner, Art Unit 1795